

## CLAIMS

What is claimed is:

1. A voice access system for enabling voice access to an enterprise data system, comprising:
  - a voice recognition unit, including:
    - a processor;
    - a telephony interface coupled to the processor to enable the voice recognition unit to receive user input via a telephone connection; and
    - a network interface coupled to the processor to enable the voice recognition unit to be linked in communication with the enterprise data system via a computer network; and
    - a memory in which a plurality of machine executable instructions are stored comprising a plurality of software modules; and
  - a speech processing server, including:
    - a processor;
    - a network interface coupled to the processor to enable the voice recognition unit to be linked in communication with the voice recognition unit via a computer network; and
    - a memory in which a plurality of machine executable instructions are stored comprising a plurality of software modules,
- wherein the software modules when executed by the processors of the voice recognition unit and the speech processing server interact with each other to perform operations comprising:

22 enabling a user to establish a telephone connection with the voice recognition  
23 unit;  
24 enabling the user to request an ad hoc query be performed against data  
25 stored by the enterprise data system using a spoken natural language query;  
26 determining query criteria corresponding to the ad hoc query request by the  
27 user;  
28 sending the query criteria to the enterprise data system;  
29 receiving data from the enterprise data system based on the query criteria;  
30 providing feedback data corresponding to data received from the enterprise  
31 data system in a verbal format to the user via the telephone connection.

1 2. The voice access system of claim 1, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:  
4 authenticating the user with the voice access system using a login process in  
5 which the user is identified by a unique user identifier;  
6 determining enterprise log-in data that enables the user to access the  
7 enterprise data system, based on the unique user identifier for the voice access  
8 system;  
9 automatically logging the user into the enterprise data system using the  
10 enterprise data system log-in data.

1 3. The voice access system of claim 2, wherein the voice recognition unit is  
2 linked in communication with a local database in which a plurality of unique  
3 identifiers and corresponding pass-codes are stored, and wherein the voice access  
4 system authenticates the user by performing operations comprising:

5 receiving user-identification information from the user via the telephone  
6 connection;  
7 comparing the user-identification information with user-identification data  
8 stored in the local database; and  
9 authenticating the user if the user-identification information received from the  
10 user matches the user-identification data stored in the local database.

1 4. The voice access system of claim 1, wherein one of said plurality of software  
2 modules stored in the memory of the voice recognition unit comprises a client-side  
3 module that enables the voice recognition unit to access the enterprise data system  
4 as a client.

1 5. The voice access system of claim 1, wherein one of said plurality of software  
2 modules stored in the memory of the speech processing server comprises a voice  
3 recognition component that converts voice waveform data into text data.

1 6. The voice access system of claim 5, wherein the voice recognition  
2 component comprises a voice recognition server and one of said plurality of  
3 software modules stored in the memory of the voice recognition unit comprises a  
4 voice recognition client, and wherein execution of the voice recognition client and  
5 server performs operations comprising:  
6 submitting voice waveform data from the voice recognition client to the voice  
7 recognition server;  
8 converting the voice waveform data into text data with the voice recognition  
9 server; and

10            sending the text data from the voice recognition server back to the voice  
11            recognition client.

1        7.        The voice access system of claim 1, wherein one of said plurality of software  
2        modules stored in the memory of the voice recognition unit includes a voice  
3        application that manages interactions between users of the voice access system  
4        and the voice access system.

1        8.        The voice access system of claim 1, wherein one of said plurality of software  
2        modules stored in the memory of the speech processing server includes a text-to-  
3        speech server that converts text data into computer-generated audible speech  
4        corresponding to the data retrieved from the enterprise data system.

1        9.        The voice access system of claim 1, where determining the query criteria  
2        corresponding to the ad hoc query request by the user comprises:  
3                converting the spoken natural language query into a data request in a text  
4        form; and  
5                identifying one or more object(s) and data criteria corresponding the spoken  
6        natural language query based on the data request.

1        10.       The voice access system of claim 9, wherein the enterprise data system  
2        includes an object manager and data manager, wherein execution of said plurality of  
3        software modules by the processor of the voice recognition unit further performs the  
4        operation of passing information corresponding to any objects and data criteria that  
5        are identified to the object manager,

6 wherein the enterprise data system formulates a data query based on the  
7 objects and data criteria passed to the object manager in consideration of enterprise  
8 database schema information available to the data manager and returns data  
9 retrieved by the data query to the voice recognition unit.

1 11. The voice access system of claim 1, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 authenticating the user with the voice access system using a login process in  
5 which the user is identified by a unique user identifier;  
6 retrieving data pertaining to a selected object for the user from the enterprise  
7 database through use of the unique user identifier; and  
8 providing feedback data corresponding to any data that are retrieved in a  
9 verbal format to the user via the telephone connection.

1 12. A voice access system for enabling voice access to an enterprise data  
2 system, comprising:

3 a voice recognition unit, including:

4 a processor;

5 an telephony interface coupled to the processor to enable the voice  
6 recognition unit to receive user input via a telephone connection; and

7 a network interface coupled to the processor to enable the voice  
8 recognition unit to be linked in communication with the enterprise data system  
9 via a computer network; and

10 a memory in which a plurality of machine executable instructions are  
11 stored comprising a plurality of software modules; and

12 a speech processing server, including:  
13 a processor;  
14 a network interface coupled to the processor to enable the voice  
15 recognition unit to be linked in communication with the voice recognition unit  
16 via a computer network; and  
17 a memory in which a plurality of machine executable instructions are  
18 stored comprising a plurality of software modules,  
19 wherein the software modules when executed by the processors of the voice  
20 recognition unit and the speech processing server interact with each other to  
21 perform operations comprising:  
22 enabling a user to establish a telephone connection to a voice access  
23 system;  
24 providing a voice user interface that enables the user to navigate and query  
25 data from a plurality of domains using spoken navigation and natural language  
26 query commands, wherein each domain comprises data corresponding to a  
27 respective type of object in the enterprise data system; and  
28 providing feedback data in a verbal format to the user via the telephone  
29 connection in response to spoken navigation and natural language query  
30 commands, said feedback data including data corresponding to data retrieved from  
31 the enterprise data system in response to the natural language query commands  
32 and system prompts in response to the spoken navigation commands.

1 13. The voice access system of claim 12, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 authenticating the user with the voice access system using a login process in  
5 which the user is identified by a unique user identifier;

6 determining enterprise log-in data that enables the user to access the  
7 enterprise data system, based on the unique user identifier for the voice access  
8 system; and

9 automatically logging the user into the enterprise data system using the  
10 enterprise data system log-in data.

1 14. The voice access system of claim 12, wherein the data received from the  
2 enterprise data system includes a plurality of data sets pertaining to an object to  
3 which the ad hoc query corresponds to, and wherein execution of the plurality of  
4 software modules by the processors of the voice recognition unit and the speech  
5 processing server further performs the operation of enabling the user to browse the  
6 plurality of data sets.

1 15. The voice access system of claim 12, wherein the ad hoc query comprises a  
2 request to retrieve data corresponding to a domain the user is currently in and the  
3 data received from the enterprise data system includes a plurality of data sets  
4 comprising header data identifying items pertaining to the current domain, and  
5 wherein execution of the plurality of software modules by the processors of the voice  
6 recognition unit and the speech processing server further performs the operations  
7 of:

8 enabling the user to browse the header data on an item-by-item basis using  
9 navigation commands; and

10 reading the header data corresponding to each item in response to a user  
11 navigation to that item. .

1 16. The voice access system of claim 15, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 enabling the user to request detail information corresponding to an item that  
5 is currently being browsed;

6 generating a data request to receive detail information from the enterprise  
7 data system corresponding to the item currently being browsed;

8 submitting the data request to the enterprise data system;

9 receiving data from the enterprise data system comprising detail information  
10 corresponding to the item currently being browsed; and

11 reading the detail information to the user via the telephone connection.

1 17. The voice access system of claim 12, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 maintaining navigation tracking information for the user that identifies  
5 navigation locations the user has previously navigated to; and

6 selecting system prompts based on the navigation tracking information for the  
7 user such that the user is presented with a different system prompt if the user has  
8 not previously navigated to a current navigation location than the user is presented  
9 with if the user has previously navigated to the current navigation location.

1 18. A voice access system for enabling voice access to an enterprise data  
2 system, comprising:

3 a voice recognition unit, including:



4 a processor;

5 an telephony interface coupled to the processor to enable the voice

6 recognition unit to receive user input via a telephone connection; and

7 a network interface coupled to the processor to enable the voice

8 recognition unit to be linked in communication with the enterprise data system

9 via a computer network; and

10 a memory in which a plurality of machine executable instructions are

11 stored comprising a plurality of software modules; and

12 a speech processing server, including:

13 a processor;

14 a network interface coupled to the processor to enable the voice

15 recognition unit to be linked in communication with the voice recognition unit

16 and a local database via a computer network;

17 a memory in which a plurality of machine executable instructions are

18 stored comprising a plurality of software modules; and

19 a storage device in which a set of grammars comprising a language

20 and syntax defining a format in which data are phonetically represented are

21 stored,

22 wherein the software modules when executed by the processors of the voice

23 recognition unit and the speech processing server interact with each other to

24 perform operations comprising:

25 retrieving selected data from the enterprise data system;

26 pre-compiling the data into a form corresponding to the set of grammars;

27 storing the pre-compiled data in a local database that is apart from the

28 enterprise data system

29 enabling a user to establish a telephone connection with the voice access  
30 system;

31 enabling the user to request an ad hoc query be performed against data  
32 stored in the enterprise data system and/or local database using a spoken natural  
33 language query;

34 converting the spoken natural language query into a data request and  
35 retrieving data from the enterprise data system and/or local database  
36 corresponding to the ad hoc query; and

37 providing feedback data corresponding to data that are retrieved in a verbal  
38 format to the user via the telephone connection.

1 19. The voice access system of claim 18, wherein header data that are used to  
2 identify objects are stored in the local database while detail data corresponding to  
3 the objects are stored in the enterprise data system.

1 20. The voice access system of claim 18, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 enabling an administrator to define a set of objects for which data in the  
5 enterprise data system are to be pre-compiled;

6 enabling the administrator to define a schedule identifying when data  
7 corresponding to the set of objects are to be pre-compiled; and

8 automatically pre-compiling data corresponding to those objects based on the  
9 schedule.

21. A voice access system for enabling voice access to an enterprise data system, comprising:

- a voice recognition unit, including:
  - a processor;
  - an telephony interface coupled to the processor to enable the voice recognition unit to receive user input via a telephone connection; and
  - a network interface coupled to the processor to enable the voice recognition unit to be linked in communication with the enterprise data system via a computer network; and
  - a memory in which a plurality of machine executable instructions are stored comprising a plurality of software modules; and
- a speech processing server, including:
  - a processor;
  - a network interface coupled to the processor to enable the voice recognition unit to be linked in communication with the voice recognition unit via a computer network; and
  - a memory in which a plurality of machine executable instructions are stored comprising a plurality of software modules,

wherein the software modules when executed by the processors of the voice recognition unit and the speech processing server interact with each other to perform operations comprising:

- enabling a user to establish a telephone connection to a voice access system;
- authenticating the user with the voice access system using a login process in which the user is identified by a unique user identifier;

26 enabling the user to request to call a person or entity using a spoken  
27 command;  
28 determining a telephone number for the person or entity through query of the  
29 enterprise data system in response to the spoken command; and  
30 transferring the initial telephone connection to a new connection that  
31 connects the user with the person or entity via the telephone number for the person  
32 or entity.

1 22. The voice access system of claim 21, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operations of:

4 determining enterprise log-in data that enables the user to access the  
5 enterprise data system, based on the unique user identifier for the voice access  
6 system; and

7 automatically logging the user into the enterprise data system using the  
8 enterprise data system log-in data;

1 23. The voice access system of claim 21, wherein execution of the plurality of  
2 software modules by the processors of the voice recognition unit and the speech  
3 processing server further performs the operation of reconnecting the user to the  
4 voice access system after the call to the person or entity has been completed.

1 24. The voice access system of claim 23, wherein the user is reconnected to the  
2 voice access system such that the user is returned to a navigation context that the  
3 user had prior to transfer of the initial telephone connection to the new connection.